PUMP ACCURACY
CHECK KIT
INSTRUCTION MANUAL

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SECTION I: GENERAL INFORMATION

1.0 PURPOSE:

The purpose of the Pump Accuracy Check Kit is to provide a simple field check of the rate accuracy of the PCA I Pump, InfusO.R.™ Pump, Mini-Infuser Pumps, and PCA II Pump.

2.0 EQUIPMENT REQUIRED:

2.1 Distance Gauge Kit (Catalog. no. 6464460)
Kit includes: Distance gauge
Barrel simulator
Plunger simulator
Manual

2.2 Stopwatch

3.0 INSTALLING THE DISTANCE GAUGE:

NOTE: For Mini-Infuser Pump Model 100 only, use small barrel simulator cat. no. 6461239 and small plunger simulator cat. no. 6461241.

3.1 Assemble the distance gauge as shown in Figure 1.
CAUTION: Do not overtighten the barrel simulator or damage may result. Use only light finger pressure.
3.2 Turn the outer dial on the distance gauge until the zero position is aligned with the needle.
3.3 With the pump turned off, disengage the pusher block and move it to the top of the pump.
3.4 Place the distance gauge assembly into the syringe holder as shown in Figure 2.
3.5 Move the pusher block down so that it captures the plunger simulator on the end of the gauge as shown in Figure 2.
3.6 Use the proper section of this Manual to perform the accuracy check on the appropriate pump.

4.0 READING THE DISTANCE GAUGE:

The outer dial of the gauge shows thousandths of an inch from 0.001 to 0.099 while the small inner dial shows the number of tenths of inches of travel. The value of the inner dial must be added to the value of the outer dial before recording a reading.

5.0 IF THE PUMP FAILS:

If any pump fails this testing, check the set-up and restart the test. Any pump that continues to fail must be removed from service until it is properly repaired.

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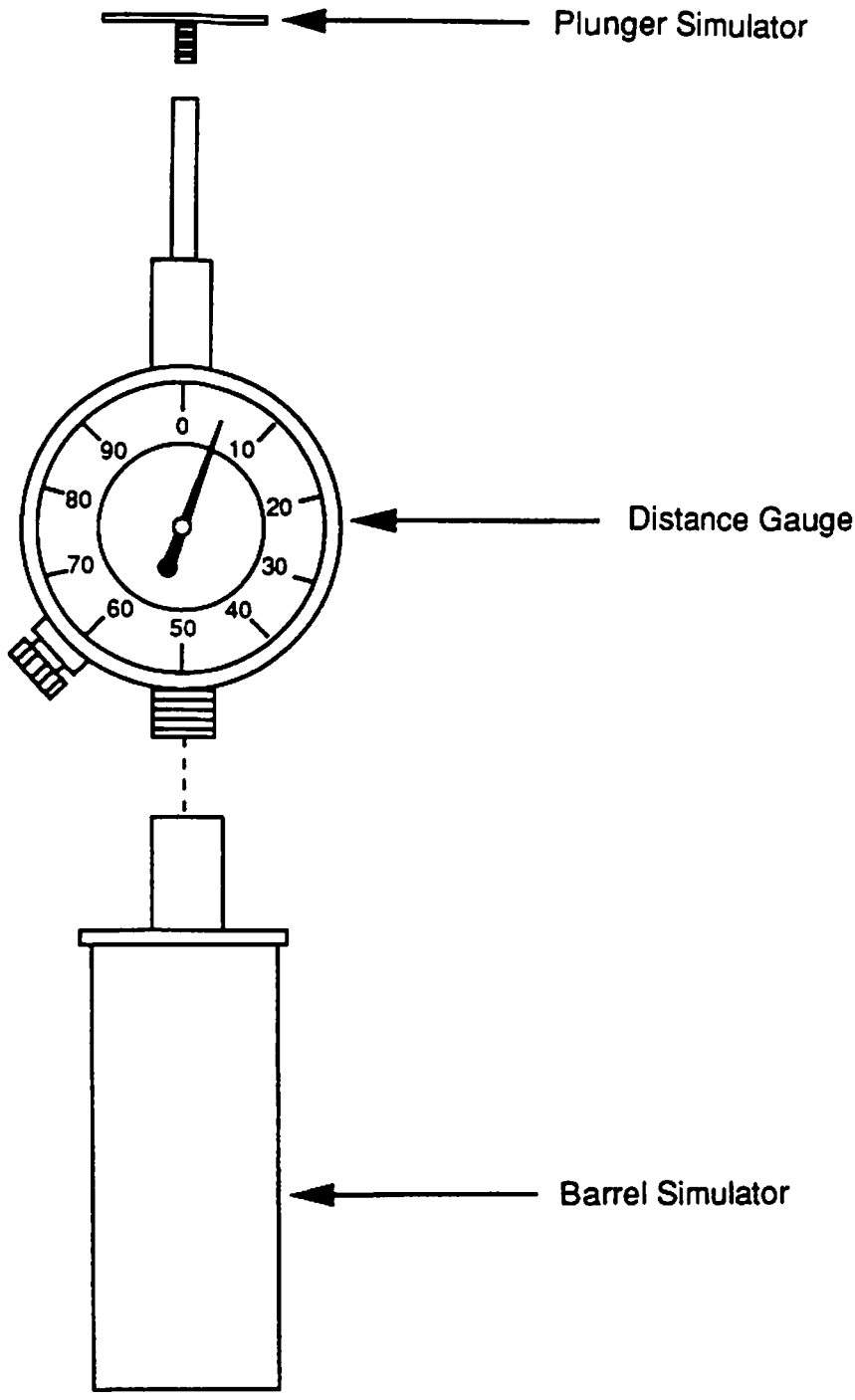
Plunger Simulator
0
10
20
30
40
50
60
70
80
90
Distance Gauge
Barrel Simulator

FIGURE 1

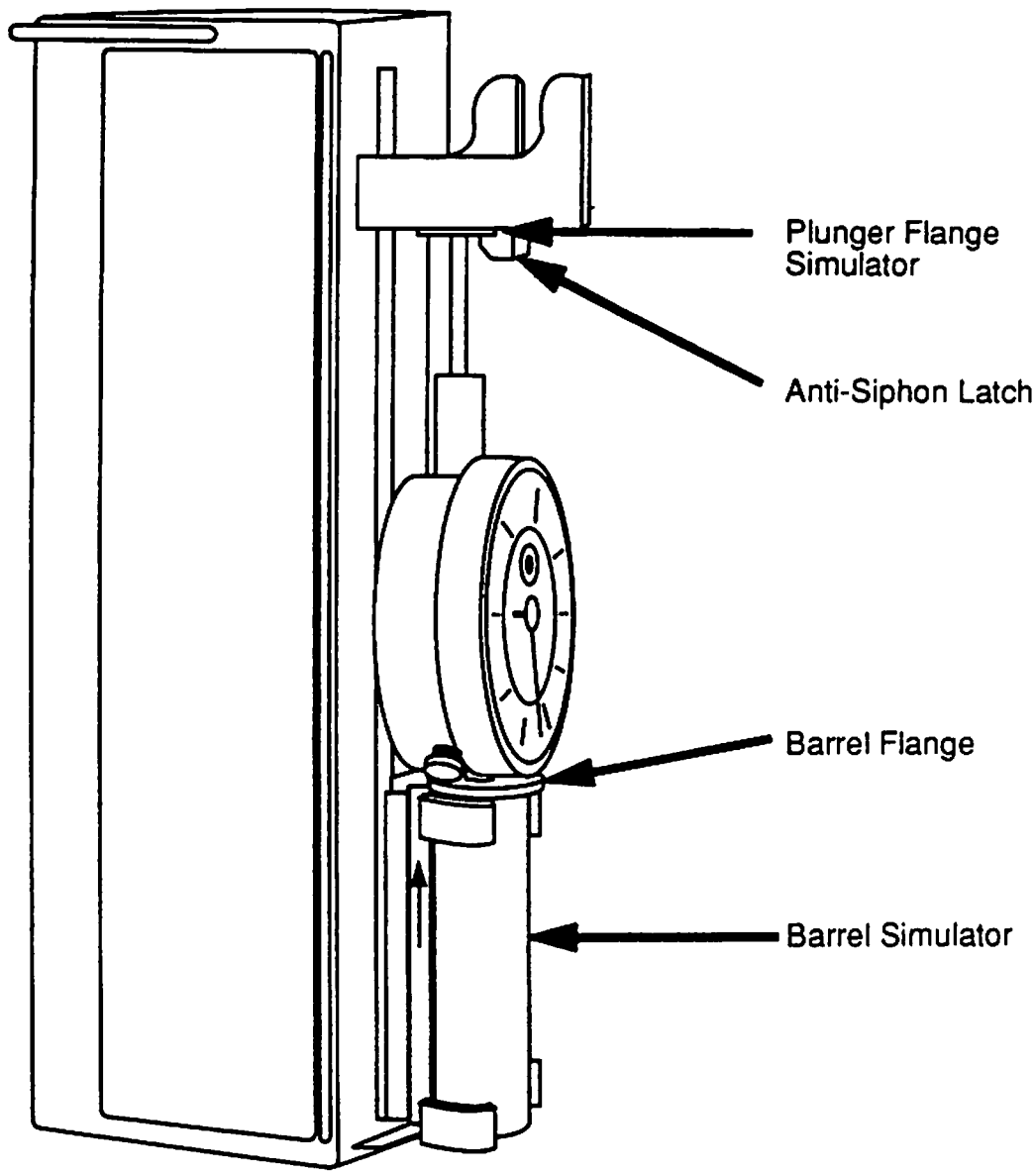
Plunger Flange
Simulator
Anti-Siphon Latch
Barrel Flange
Barrel Simulator

FIGURE 2

SECTION II: PCA I PUMP ACCURACY CHECK PROCEDURE

1.0 PRIMING THE PUMP.

1.1 Ensure that the distance gauge is properly installed on the pump (see Section I).

1.2 Turn the pump on.

1.3 Depress the **PRIME** key until the needle on the distance gauge has moved about 0.020 inches.

1.4 Record the reading from the distance gauge as **Reading #1** on the Accuracy Chart shown on page 6.

2.0 SETTING THE PRESCRIPTION.

2.1 Set the **Dose** dial to 2 mL, the **Delay** dial to 3 minutes and the **Basal Rate** dial to "off".

2.2 Press the **1 Hour Limit** key five times so that the limit is set to 10 mL.

2.3 Press the **Bolus** key seven times so that a 3.0 mL bolus is set.

2.4 Lock the syringe cover.

3.0 TESTING THE BOLUS ACCURACY.

3.1 Simultaneously press the **Start/Stop** key and start the stopwatch. The motor will run, causing the distance gauge to move. The display will begin counting the delivered volume.

3.2 When the end of the bolus is signaled by the first of three beeps, stop the stopwatch. Record the stopwatch and distance gauge readings as **Reading #2** on the Accuracy Chart.

3.3 Subtract the distance gauge **Reading #1** from distance gauge **Reading #2**; record the result as **#2-#1** and compare it against the allowable value.

4.0 TESTING THE DOSE ACCURACY.

4.1 Ensure that the patient control cable is connected to the pump.

4.2 Reset the stopwatch.

4.3 Press the **Start/Stop** key. The display should show "PCA".

4.4 Wait at least 3 minutes, then simultaneously press the patient control button and start the stopwatch. The pump will beep and the motor will run.

4.5 When the distance gauge stops moving, stop the stopwatch. Record the stopwatch and distance gauge readings as **Reading #3** on the Accuracy Chart.

4.6 Subtract the distance gauge **Reading #2** from distance gauge **Reading #3**; record the result as **#3-#2** and compare it against the allowable value.

5.0 TESTING THE BASAL RATE ACCURACY.

5.1 Reset the stopwatch.

5.2 Unlock the syringe cover **without** opening the cover.

5.3 Change the **Basal Rate** dial to 5 mL/hour.

5.4 Press the **1 Hour Limit** key three times so that the limit is set to 5 mL.

5.5 Close and lock the syringe cover.

5.6 Simultaneously press the **Start/Stop** key and start the stopwatch.

5.7 When the stopwatch reads 30 minutes, press the **Start/Stop** key again. Record the distance gauge reading as **Reading #4** on the Accuracy Chart.

5.8 Subtract the distance gauge **Reading #3** from distance gauge **Reading #4**; record the result as **#4-#3** and compare it against the allowable value.

- Convert the time on the stopwatch into decimal format (e.g. 40 min.-15 sec. would be 40.25 min.);
- Multiply this time by .00587"/min.;
- Compare this result with the **#4-#3** value on the Accuracy Chart. For every 6 minutes period exceeding the 30 minutes, add $\pm$ .001" to the tolerance (e.g. at 36 minutes, the tolerance would be $\pm$ .006", etc.).

To ensure that the distance gauge has not reached its travel limit, this basal rate test should not exceed 60 minutes.

6.0 REMOVING THE DISTANCE GAUGE.

6.1 Open the syringe cover and turn the pump off.

6.2 Disengage the pusher block and move it to the top of the pump.

6.3 Remove the distance gauge assembly.

PCA I Pump Accuracy Check

Pump Serial Number: _____

Date: _____

Performed by: _____

	Distance gauge	Stopwatch
Reading #1	_____	
Reading #2	_____	_____ (1 min. 12 sec. ± 2 sec.)
#2 - #1 =	_____ (0.212 ± 0.006 inches)	
Reading #3	_____	_____ (48.0 sec. ± 1.5 sec.)
#3 - #2 =	_____ (0.141 ± 0.004 inches)	
Reading #4	_____	
#4 - #3 =	_____ (0.176 ± 0.005 inches)	

SECTION III: INFUSO.R.™ PUMP ACCURACY CHECK PROCEDURE

1.0 PRIMING THE PUMP.

1.1 Ensure that the distance gauge is properly installed on the pump (see Section I).

1.2 Attach any Smart Label to the face of the pump.

1.3 Turn the Function switch to "**Purge**" and hold it until the needle on the distance gauge has moved about 0.020 inches.

1.4 Record the reading on the distance gauge as **Reading #1** on the Accuracy Chart shown on page 10.

2.0 TESTING THE BOLUS ACCURACY.

NOTE: Bolus accuracy may be checked only with those labels described in TABLE 1.

2.1 Set the **Bolus** switch to the setting indicated in TABLE 1. The table lists bolus settings for each appropriate label number. Find the setting that corresponds to the label attached to the pump.

2.2 Set the **Body Weight** switch to the setting indicated in TABLE 1.

2.3 Set the **Syringe Selector** switch to "**Mono**".

NOTE: When measuring the Bolus travel, the Syringe Manufacturer Selector switch must be in the "**Mono**" position.

TABLE 1

INFUSO.R.™ BOLUS TRAVEL

Label #	Drug	Bolus		Body Weight (kg)	Displacement (inches)
L01	Alfentanil	15	mcg/kg	30	0.0635 +/- 0.0019
	Succinylcholine	300	mcg/kg	30	0.0635 +/- 0.0019
L02	Propofol	1000	mcg/kg	70	0.4932 +/- 0.0148
L03	Atracurium	200	mcg/kg	50	0.1215 +/- 0.0036
L04	Vecuronium	100	mcg/kg	35	0.4248 +/- 0.0127
	Fentanyl	5	mcg/kg	35	0.4248 +/- 0.0127
L08	Esmolol	2000	mcg/kg	45	0.6346 +/- 0.0190
L10	Sufentanil	1.5	mcg/kg	40	0.1456 +/- 0.0044

2.4 Turn the Function switch to "**Stop/Confirm**" and verify the label identification code with the pump's display.

2.5 Turn the Function switch to "**Bolus Start**" and hold it until a beep is heard.

2.6 Release the switch and the bolus will begin. The motor will run causing the distance gauge to move.

2.7 When the distance gauge stops moving, the bolus is completed. Record the gauge reading as **Reading #2** on the Accuracy Chart.

2.8 Subtract the distance gauge **Reading #1** from the distance gauge **Reading #2**. Record the result as **#2-#1** and compare it to the linear travel value given in TABLE 1 for that Smart Label and Bolus and Body Weight setting selections.

3.0 TESTING THE INFUSION RATE ACCURACY.

3.1 Set the **Infusion Rate** switch to the setting indicated in TABLE 2 for the Smart Label that is attached to the pump.

3.2 Set the **Body Weight** switch to the setting indicated in TABLE 2 for the Smart Label that is attached to the pump.

3.3 Set the **Syringe Selector** switch to "**B-D**".

NOTE: When measuring these linear rates, the Syringe Manufacturer Selector switch must be in the "**B-D**" position.

TABLE 2
INFUSO.R.™ INFUSION RATES

Label #	Drug	Infusion Rate		Body Weight (kg)	Linear Rate(in/hr)
L01	Alfentanil	0.25	mcg/kg/min	30	0.0635 +/- 0.0019
	Succinylcholine	5	mcg/kg/min	30	0.0635 +/- 0.0019
L02	Propofol	25	mcg/kg/min	100	1.0569 +/- 0.0317
L03	Atracurium	8	mcg/kg/min	40	0.2632 +/- 0.0079
L04	Vecuronium	1.2	mcg/kg/min	50	0.4929 +/- 0.0148
	Fentanyl	3.6	mcg/kg/hr	50	0.4929 +/- 0.0148
L05	Dobutamine	14	mcg/kg/min	60	0.7110 +/- 0.0213
L06	Dopamine	1.0	mcg/kg/min	70	0.0740 +/- 0.0022
L07	Isoproterenol	2.0	mcg/min	N/A	0.4230 +/- 0.0127
	Epinephrine	2.0	mcg/min	N/A	0.4230 +/- 0.0127
	Lidocaine	1.0	mg/min	N/A	0.4230 +/- 0.0127
	General mL	6	mL/hr	N/A	0.4230 +/- 0.0127
L08	Esmolol	100	mcg/kg/min	30	1.2683 +/- 0.0380
L09	Nitroglycerin	3	mcg/kg/min	90	1.1418 +/- 0.0343
	Nitroprusside	3	mcg/kg/min	90	1.1418 +/- 0.0343
L10	Sufentanil	0.8	mcg/kg/hr	50	0.1097 +/- 0.0033

3.4 Turn the Function switch to "**Stop/Confirm**" from "**Off**" and verify the label identification code with the pump's display.

3.5 Simultaneously turn the Function switch to "**Infuse**" and start the stopwatch. The motor will pulse causing the distance gauge to move in steps.

3.6 When the stopwatch reads 30 minutes, turn the Function switch to "**Stop/Confirm**". Record the distance gauge reading as **Reading #3** on the Accuracy Chart.

3.7 Subtract the distance gauge **Reading #2** from **Reading #3**. Multiply this value by 2 to get the linear travel in inches/hour; record the result as **(#3-#2) x 2** and compare it to the linear rate value given in TABLE 2 for that Smart Label and Infusion Rate and Body Weight setting selections.

NOTE: The total linear travel that the gauge can measure is 1.0 inch. Choose bolus and infusion rate combinations to test that will not exceed 1.0 inch of linear travel.

4.0 REMOVING THE DISTANCE GAUGE.

4.1 Turn the pump off.

4.2 Disengage the pusher block and move it to the top of the pump.

4.3 Remove the distance gauge assembly.

INFUSO.R.™ PUMP ACCURACY CHECK

Pump Serial Number:_____

Date:_____

Performed by:_____

BOLUS TESTING:

Label # Tested:_____

Bolus setting:_____mcg/kg

Body Weight setting:_____kg

Reading #1_____inches

Reading #2_____inches

#2 - #1 =_____inches

Desired value from bolus table_____inches

INFUSION RATE TESTING:

Label # tested:_____

Infusion Rate setting:_____

Body Weight setting:_____kg

Reading #3_____inches

#3 - #2 = _____inches

(#3 - #2) x 2 = _____inches

Desired value from infusion table_____inches/hr

SECTION IV: MINI-INFUSER PUMP ACCURACY CHECK PROCEDURE

1.0 PRIMING THE PUMP.

1.1 Ensure that the distance gauge is properly installed on the pump (see Section I).

1.2 Turn the pump on and allow the pump to run until the needle on the distance gauge has moved about 0.020 inches. (For models 400, 900 and 950, turn the Function switch to "**Purge**" and hold it until the needle on the distance gauge has moved about 0.020 inches.)

2.0 TESTING THE INFUSION RATE ACCURACY.

2.1 If applicable, set the pump to the proper rate setting(s) as indicated on the Data Chart on page 12.

2.2 Simultaneously turn the pump on and start the stopwatch. (For models 400, 900 and 950, simultaneously turn the Function switch to "**Infuse**" and start the stopwatch.)

2.3 When the distance gauge has moved exactly one full revolution (0.100 inches), stop the stopwatch. Turn the pump off. Compare the measured time against the prescribed time from the Data Chart and check that it is within the acceptable criterion for that pump.

3.0 REMOVING THE DISTANCE GAUGE.

3.1 Disengage the pusher block and move it to the top of the pump.

3.2 Remove the distance gauge assembly.

DATA CHART				
MINI-INFUSER PUMP	RATE SETTING	DISTANCE (INCHES)	TIME (MIN:SEC.)	ACCEPTANCE CRITERIA (%)
100	(N/A)	0.100	1:29.7	±3%
150 AND 150XL	(N/A)	0.100	1:05.7	±3%
200	(N/A)	0.100	0:45.1	±3%
300	H	0.100	0:32.8	±3%
	M	0.100	1:05.7	
	L	0.100	2:11.4	
300XL	M	0.100	1:05.7	±3%
	L	0.100	2:11.4	
	XL	0.100	3:17.0	
400	5 mL 30 min	0.100	8:34.6	±3%
	10 mL 15 min	0.100	2:07.0	
	20 mL 15 min	0.100	1:03.5	
	20 mL 10 min	0.100	0:42.5	
900 AND 950	100 kg 3 mcg/kg-min	0.100	2:23.3	±3%
	50 kg .5 mcg/kg-min	0.100	28:40.3	

SECTION V: PCA II PUMP ACCURACY CHECK PROCEDURE

1.0 STARTING THE PUMP

1.1 Ensure that the distance gauge is properly installed on the pump (see Section I).

1.2 Ensure that there is a cartridge in the pump.

1.3 Turn the pump on. Allow the pump to perform its self-test cycle. This takes approximately 10 seconds. At the completion of the self tests, the pump will beep 3 times and a few seconds later the screen will display the cartridge type, the software version and the prompt **"Press [ENTER]."**

1.4 Press the **Enter** key.

1.5 Press the **Clear** key and note the 3-digit security code for future use.

1.6 Press the **Enter** key.

1.7 Close and lock the syringe cover.

1.8 Press the **Clear** key.

2.0 SETTING THE PRESCRIPTION

2.1 Press the **2** key to choose Basal/PCA. The Date and Time screen will appear. Setting the date and time at this point is optional. Press the **Enter** key to proceed.

2.2 Press the **1** key then the **Enter** key to choose mL.

2.3 Press the **2** key then the **Enter** key to enter a dose of 2 mL.

2.4 Press the **3** key then the **Enter** key to enter a delay of 3 minutes.

2.5 Press the **0** key then the **Enter** key to enter no basal rate at this time.

2.6 Press the **3** key then the **0** key then the **Enter** key to enter a 30 mL 1-hr. limit.

2.7 Display should now read:

Verify Rx:

Dose: 2.0 mL
Delay: 3 min
1 hr limit: 30.0 mL

ENTER OR CLEAR

If so, press the **Enter** key. If not, press the **Clear** key and re-enter the prescription.

3.0 INITIATING THE DIAL INDICATOR

3.1 Press the **1** key to choose a bolus dose.

3.2 Press the **2** key then the **Enter** key to enter a bolus dose of 2 mL.

3.3 Press the **Start/Stop** key. When the needle on the distance gauge reads approximately .020", press the **Start/Stop** key.

3.4 Record the reading from the distance as **Reading #1** on the Accuracy Chart shown on page 17.

3.5 Press the **Clear** key to cancel the bolus.

3.6 Press the **Clear** key to review the prescription.

3.7 Press the **Enter** key to verify the prescription.

4.0 TESTING THE BOLUS ACCURACY

4.1 Press the **1** key to choose a bolus dose.

4.2 Press the **3** key then the **Enter** key to enter a bolus dose of 3 mL.

4.3 Simultaneously press the **Start/Stop** key and start the stopwatch. The motor will run, causing the distance gauge to move. The display will begin counting the delivered volume.

4.4 When the end of the bolus is signaled by the first of three beeps, stop the stopwatch. Record the stopwatch and distance gauge readings as **Reading #2** on the Accuracy Chart.

4.5 Subtract the distance gauge **Reading #1** from distance gauge **Reading #2**; record the result as **#2-#1** and compare it against the allowable value.

5.0 TESTING THE DOSE ACCURACY

5.1 Ensure that the Patient Control Cable is connected to the pump.

5.2 Reset the stopwatch.

5.3 Press the **Start/Stop** key. The display should show **"PCA Mode."**

5.4 Wait at least 3 minutes, then simultaneously press the patient control button and start the stopwatch. The pump will beep and the motor will run.

5.5 When the distance gauge stops moving, stop the stopwatch. Record the stopwatch and distance gauge readings as **Reading #3** on the Accuracy Chart.

5.5 Subtract the distance gauge **Reading #2** from distance gauge **Reading #3**; record the result as **#3-#2** and compare it against the allowable value.

6.0 TESTING THE BASAL RATE ACCURACY

6.1 Reset the stopwatch.

6.2 Press the **Start/Stop** key.

6.3 Enter the 3-digit security code as noted in step 1.4. Display will show the **"Verify Rx":** screen.

6.4 Press the **Clear** key to change the prescription.

6.5 Press the **Enter** key twice to get to the Basal rate selection.

6.6 Press the **5** key then the **Enter** key to enter a basal rate of 5 mL/hr.

6.7 Press the **3** key then the **0** key then the **Enter** key to enter a 30 mL 1-hr. limit.

6.8 Display should now read:

Verify Rx:

Dose: 2.0 mL
Delay: 3 min
Basal: 5.0 mL/hr
1 hr limit: 30.0 mL

ENTER OR CLEAR

If so, press the **Enter** key. If not, press the **Clear** key and re-enter the prescription.

6.9 Simultaneously press the **Start/Stop** key and start the stopwatch.

6.10 When the stopwatch reads 30 minutes, press the **Start/Stop** key again. Record the distance gauge reading as **Reading #4** on the Accuracy Chart.

6.11 Subtract the distance gauge **Reading #3** from distance gauge **Reading #4**; record the result as **#4-#3** and compare it against the allowable value.

Note: If the 30 minutes period has been exceeded, simultaneously press the **Start/Stop** key and stop the stopwatch. Record the distance gauge reading as **Reading #4** on the Accuracy Chart. Subtract the distance gauge **Reading #3** from distance gauge **Reading #4** and record the result as **#4-#3** on the Accuracy Chart. The basal rate accuracy may be calculated as follows:

- Convert the time on the stopwatch into decimal format (e.g. 40 min.-15 sec. would be 40.25 min.);

- Multiply this time by .00587"/min.;

- Compare this result with the #4-#3 value on the Accuracy Chart. For every 6 minute period exceeding the 30 minutes, add $\pm$.001" to the tolerance (e.g. at 36 minutes, the tolerance would be $\pm$.006", etc.).

To ensure that the distance gauge has not reached its travel limit, this basal rate test should not exceed 60 minutes.

7.0 REMOVING THE DISTANCE GAUGE

7.1 Open the syringe cover and turn the pump off.

7.2 Disengage the pusher block and move it to the top of the pump.

7.3 Remove the distance gauge assembly.

PCA II Pump Accuracy Check

Pump Serial Number: _____

Date: _____

Performed by: _____

	Distance gauge	Stopwatch
Reading #1	_____	
Reading #2	_____	_____ (1 min. 12 sec. ± 2 sec.)
#2 - #1 =	_____ (0.212 ± 0.006 inches)	
Reading #3	_____	_____ (48.0 sec. ± 1.5 sec.)
#3 - #2 =	_____ (0.141 ± 0.004 inches)	
Reading #4	_____	
#4 - #3 =	_____ (0.176 ± 0.005 inches)	